

Fuel for the Future

Aerial view of the Materials and Fuels Complex (MFC) at Idaho National Laboratory (INL)



Materials and Fuels Complex (MFC)

Work on the Materials and Fuels Complex (MFC) at Idaho National Laboratory (INL) began in the late 1950s. Formerly called Argonne National Laboratory-West, the site was used for developing and testing sodium-cooled fast reactors, but its rich nuclear developmental history has proven it can support a much broader spectrum of nuclear research.

The MFC's key capabilities are:

- assembling and testing radioisotope power systems for NASA and national security missions
- pyroprocessing development for used nuclear fuel
- advanced nuclear fuel development.

Radioisotope Power Systems: The Space and Security Power Systems Facility (SSPSF) was constructed at MFC in 2004 to assemble and test radioisotope power systems for NASA and national security missions. The first system was produced for the New Horizons mission to Pluto which launched in January 2006. The mission's space battery, or radioisotope thermoelectric genera-

tor (RTG), was assembled at the complex. Engineers and operators can alter the component configuration, thus widening production and assembly at SSPSF for future assignments. Currently, engineers are developing another RTG to be used on an upcoming rover science mission to Mars scheduled for launch in 2009.

Pyroprocessing Development: Pyroprocessing, or pyrometallurgical treatment of spent nuclear fuel, is the alternative

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The Energy of Innovation



**Space and Security Power
Systems Facility (SSPSF)**



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to aqueous reprocessing technology that is being developed under the Advanced Fuel

Cycle Initiative (AFCI). The Fuel Conditioning Facility (FCF) houses this activity and is supported by the Hot Fuel

Examination Facility (HFEF) and the Radioactive Scrap and Waste Facility (RSWF).

Advanced Nuclear Fuel Development and Examination: MFC is a major center for the Department of Energy's advanced nuclear fuel development initiatives, including those being developed in support of the Advanced Fuel Cycle Initiative, the Generation-IV reactor technology program, and the Reduced Enrichment Research and Test Reactor (RERTR) Program. Nuclear fuels are fabricated at the MFC, tested in the Advanced Test Reactor (ATR) and examined in the Hot Fuel Examination Facility (HFEF).

Major MFC facilities include:

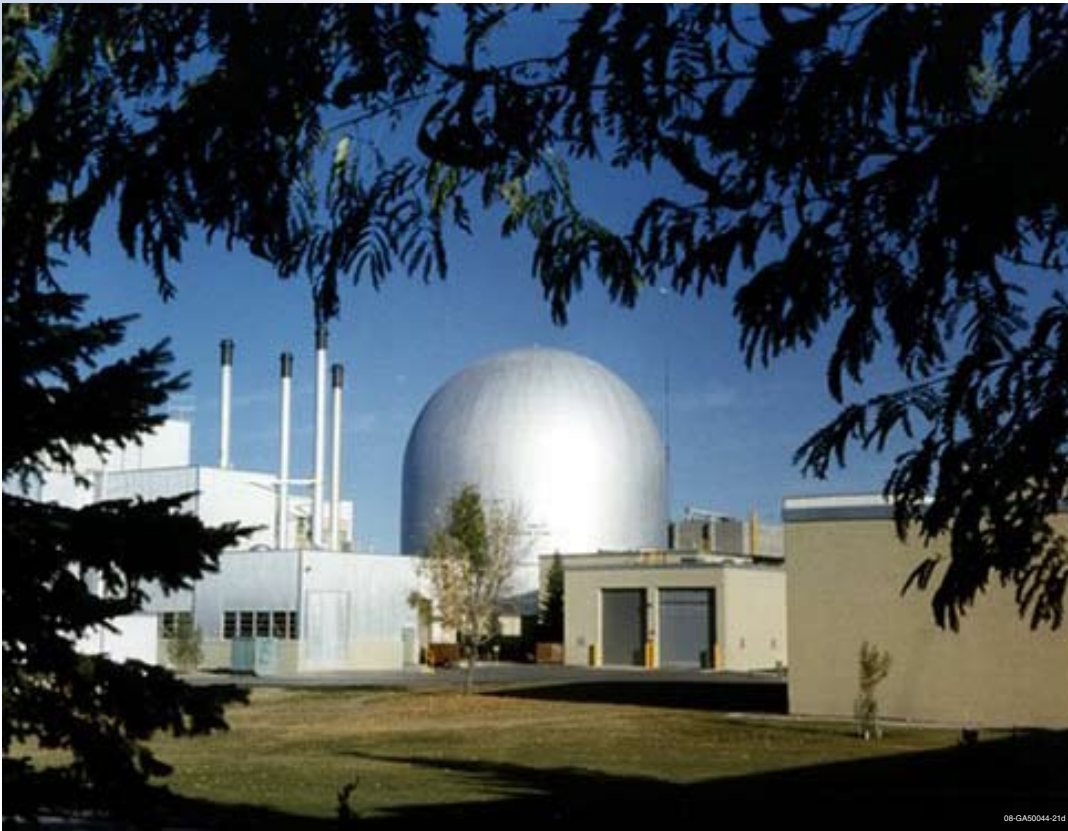
- Space and Security Power Systems Facility (SSPSF)
- Experimental Breeder Reactor-II (EBR-II) was a sodium-cooled reactor that had its own on-site metallic fuel reprocessing facility. A

**An INL materials engineer
explains the process of state-
of-the-art Eddy Current testing
equipment inside the hot cell
at the Hot Fuels Examination
Facility (HFEF) at MFC.**



- breeder reactor is one that can produce more fuel than it consumes. It performed almost flawlessly from 1964 to 1994 when the program was halted. It was one of the longest operating reactors.
- The Fuel Conditioning Facility (FCF) became operational in 1964 and demonstrated fuel reprocessing for EBR-II. In 1969, the fuel reprocessing mission was discontinued and the facility was equipped to handle and examine irradiated fuels and materials experiments from EBR-II and the Transient Reactor Test Facility (TREAT). FCF was refurbished in 1994 and finished the EBR-II Spent Fuel Demonstration in 1996. Today, FCF treats EBR-II and other DOE spent fuel.
 - Hot Fuel Examination Facility (HFEF) was placed in operation in 1975 to provide a two hot-cell complex for handling irradiated reactor fuel and structural materials. HFEF hosted examinations providing data used to determine the performance of fuels and materials irradiated in EBR-II and other facilities. The facility also performs Transuranic (TRU) Waste Characterizations supporting the Waste Isolation Pilot Project in New Mexico.
 - Transient Reactor Test Facility (TREAT) is used for fuel storage and programs including special projects and training in the high-bay.
 - The Zero Power Physics Reactor (ZPPR) & Fuel Manufacturing Facility (FMF) are used for experiments, fuel surveillance and Spent Fuel Treatment Program (SFTP) product storage.
 - The Neutron Radiography Reactor (NRAD) is a 250 kW TRIGA reactor in the basement of HFEF. It is equipped with two beam tubes and two separate radiography stations that make it one of the finest facilities in the world for neutron radiography irradiation of small test components, a process not possible using conventional x-ray methods.
 - MFC's Analytical Laboratory (AL) plays an integral role as a critical support facility sustaining work done at all major facilities at MFC. The AL,

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EBR-II supported research into breeder reactor technology from 1964 to 1994, making it one of the longest operating reactors at INEL.

The Transient Reactor Test Facility (TREAT) originally supported fuels and materials research for fast breeder reactors. Now TREAT is used for fuel storage, special projects and training.

For more information

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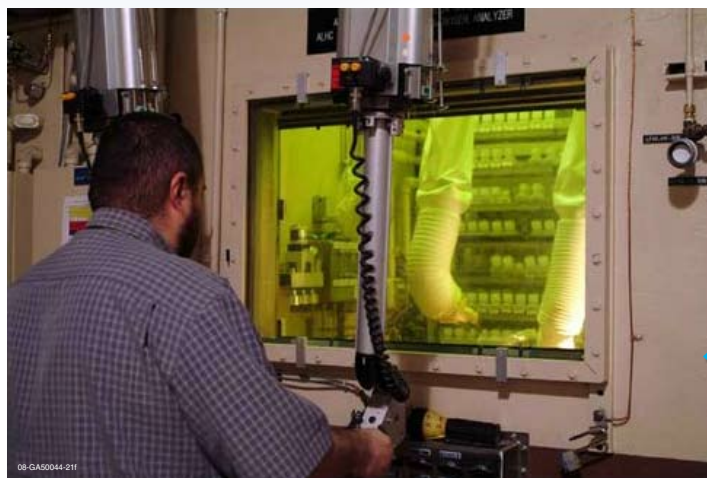
a critical leg in the INL nuclear table, performs vital chemical and isotopic analysis for fuels and materials allowing other facilities to continue

research and development of nuclear fuels and materials.

Other important MFC support facilities:

- Sodium Processing Facility (SPF)

- Radioactive Liquid Waste Treatment (RLWTF)
- Radioactive Scrap and Waste Facility (RSWF)
- Fuels and Applied Science Building (FASB)
- Electron Microscopy Laboratory (EML)
- Engineering Development Laboratory (EDL)
- Material Protection Control & Accountability Training Facility (MPCTF)



Materials analysis performed at the Analytical Laboratory supports work at all major MFC facilities.